Brief history of HVAC Controls & Building Automation Systems (BAS)

1950's & 1960's
- Reasonably Accurate Pneumatic Sensors & Controllers
- Fairly Comfortable Environmental Conditions

1960's:
- Improved System Design & Performance (VAV)
- Proliferation of Sensor/Receiver-Controller Concept
- Pneumatic Control Systems Are Industry “Norm.”

1970's:
- Micro-Chip Analog Electronic Control & Computerized Energy Management Systems
- Initial Computer Based Systems Were Costly & Performed Minimal Control Functions; Typically Only Monitored Pneumatic Control Systems

1980's:
- Pneumatic systems continue
- Microprocessor based panels with high density inputs & outputs
- Introduction of “Smart” Controllers
- Proliferation of Application-Specific DDC Control Modules
- Higher System Capability Per $ Investment

1990's:
- Electronic systems replace pneumatics
- Open Protocols Introduced: BACnet, LON
- World Wide Web Becomes Popular
Control Systems 2000 & Beyond

**2000’s:**
- Internet Dominates BAS systems
- Wireless Technologies proliferate
- Smart Building Systems
- Full Building integration
- Future ????

CURRENT BAS ISSUES & TRENDS:
- *Proprietary and open protocols.*

Protocol - properties
- Proprietary – individually controlled
- Shared – Strategic alliances
- Open – General use
- Defacto Standard – Industry accepted
  (e.g. Ethernet, Modbus, IP, etc.)
- Standard – Agency/Association Approved
  (e.g. Lontalk, Bacnet, Arcnet, etc.)

Why Open Protocol?
- **Coexistence**
  - Systems don’t interfere nor they cooperate
- **Solution Specific**
  - Requires Joint development & Engineering
- **Plug & Play**
  - Effortless integration of various manufacturing components
- **Interchangeability**
  - Products are functionally identical

That’s Why !

Levels of Interoperability
CURRENT BAS ISSUES & TRENDS:

- Proprietary and open protocols.
- **DDC control hardware is becoming a commodity**
  - *This follows the drop in the cost of electronics in general*
- A BAS is usually part of a building information systems (I.S.) backbone
- Integration to the internet is a given
- Control contractors are now system integrators

CURRENT BAS ISSUES & TRENDS:

- Proprietary and open protocols.
- DDC control hardware is becoming a commodity
- *A BAS is usually part of a building information systems (I.S.) backbone*
- Internet integration
  - BAS Designer
  - Controls Contractor
  - Open Standards
  - Building Manager
  - Internet Integration
  - System Integrator
  - Building Engineer
  - Application Standards
  - Control contractors are now system integrators
  - Software not hardware is the heart of today’s BAS systems.
CURRENT BAS ISSUES AND TRENDS CONT'D:

- New section 2300 replaces division 15 of specifications
- BAS have the capacity and are being used for much more than just control

Wireless BAS Integrations:

- Point to Point (sensor to VAV box)
- WIFI for using a laptop for commissioning
- MESH wireless networks
- Cellular modems on BAS equipment
- ZIGBEE, RFID, etc.
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- Internet user expectations drive BAS features

Same-Wire Power & Control

- Simple 120VAC light switching
- Powerline data communication
- 24VAC power & network traffic for HVAC actuators and sensors
- Utility metering & add-on services
- Home automation

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- Internet user expectations drive BAS features
- Full control systems are coming with HVAC mechanical equipment
- BAS must integrate with user’s management computer systems, there are many users, not just the building engineers
BAS ISSUES AND TRENDS CONT’D:
- Knowledge of how to control HVAC and integrate much more important than any vendor’s system
- Web services such as weather, technical database and data processors are becoming more common
- Commissioning, monitoring and trending are common uses of BAS, also data archiving
- BAS are used in LEED projects for building monitoring and performance verification

Smart Building BAS
- Knowledge based software for maintenance & re-commissioning
- Self-tuning control systems are becoming more common—besides trial & error PID tuning
- Control device manufacturer libraries replace O&M manuals
- Fuzzy logic & other techniques optimize building operations
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- BAS systems are used in LEED projects for building monitoring and performance verification  
- Smart building systems are driving innovative uses of BAS into every area of a building  
- **M2M networking driving every connected component to being internet addressable**  

**WHAT BAS TRENDS WILL HAVE STAYING POWER INTO THE FUTURE:**  
- **BAS are part of the building “IS” network, many new players are entering the market**  
- **Wireless and power-line control will dominate, reducing installation costs**  
- **Control hardware will be a smaller percentage of mechanical budget, programming costs will grow**  
- **Internet direction will drive BAS and building controls**
Old Co-existent Buildings

Current Technology

Future Technology ???

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- Wireless and power-line control will dominate, reducing installation costs
- Control hardware will be a smaller percentage of mechanical budget, programming costs will grow
- Internet direction will drive BAS and building controls
- BAS will increasingly become more utilized to manage energy and resources in a building
- Retro-commissioning both BAS and mechanical, will be driven by increasing energy costs and change in building usage
- HVAC equipment will come complete with a control system
WHAT BAS TRENDS WILL HAVE STAYING POWER INTO THE FUTURE:

- BAS is part of the building “IS” system, many other players are entering the market
- Wireless and power-line control will dominate, reducing installation costs
- Control hardware will be a smaller percentage of mechanical budget, programming costs will grow
- Internet direction will drive BAS and building controls
- BAS will increasingly become more utilized to manage energy and resources in a building
- Retro-commissioning both BAS and mechanical, will be driven by increasing energy costs and change in building usage
- Much more HVAC equipment will come complete with a control system
- Self commissioning and auto tuning systems will become the norm

Links for More Information

- www.automatedbuildings.com
- www.bacnet.org
- www.bacnetbacnet.org
- www.lonmark.org
- www.betterbricks.com
- www.caba.org
- www.ashrae.org
- www.atkinsonelectronics.com
- www.johnsoncontrols.com
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